

## LCA in Greece

### Overview of LCA Activities in Greece from LHTEE

Angeliki Boura, Christopher J. Koroneos, Nicolas Moussiopoulos

**Corresponding author:** Angeliki Boura Laboratory of Heat Transfer and Environmental Engineering (LHTEE), P.O. Box 483, Aristotle University, GR-54 006 Thessaloniki, Greece; e-mail: [aboura@aix.meng.auth.gr](mailto:aboura@aix.meng.auth.gr); <http://aix.meng.auth.gr/lhtee/>

The Laboratory of Heat Transfer and Environmental Engineering (LHTEE) belongs to the Energy Section of the Mechanical Engineering Department of Aristotle University in Thessaloniki (AUT), Greece. LHTEE is one of the first Greek bodies to get involved in LCA activities.

On December 16th, 1997, the first Greek workshop on LCA was organised at the Aristotle University of Thessaloniki by LHTEE. The meeting was held in the city of Thessaloniki with many attendees from industry and academia [1].

On February 1998, LHTEE created the Hellenic Life Cycle Assessment Network (HELCANET) to facilitate the development of LCA in Greece. HELCANET is the first and only network established in Greece for the promotion of LCA development [2].

#### I Research Activities

1. Planning of energy systems – Life Cycle Analysis, Coordinator and Research Leader AUT: N. Moussiopoulos, Funded by: General Secretariat of Research and Development (EPET II), Budget for AUT: 32 MDrs., 1999-2001.
2. Liquid Hydrogen Fuelled Aircraft – System Analysis (CRYO-PLANE), Coordinator: Dr. H. G Klug (DaimlerChrysler Aerospace Airbus GmbH), Research Leader AUT: N. Moussiopoulos, Funded by: EC, 5th Framework Programme, Budget for AUT: 153,450 EURO, 2000-2001.

#### II Academic Activities

##### Courses

1. Technologies for Environmental Protection (9th semester).
2. Environmental Management (9th semester). *Both courses have a major component of LCA.*
3. Recycling and LCA of Materials and Systems (9th semester).

##### Ph.D. Dissertations

Development of LCA Methodology for the Greek Food Industry, Boura A.

##### Master Thesis

LCA of Greek Cotton Processing, Tsikos Y. (in collaboration with EAEME)

##### Diploma Thesis

###### Completed:

1. Life Cycle Assessment of Cardboard Production (Nov. 1998), Chliopanou H. and Ilia F.
2. Life Cycle Assessment of a Brick (Feb. 2000), Kontogeorgiou S.
3. Life Cycle Assessment of Photovoltaic Systems (Feb. 2000), Stylos N.
4. Life Cycle Assessment of Tomato Paste in Aseptic and Cardboard Packaging (July 2000), Katidis S.

5. Life Cycle Assessment and Exergy Analysis of Electricity Production from a Combined Cycle Plant using Natural Gas (July 2000), Dimou D. and Andrinopoulos N.
6. Increasing Energy Performance through Co-production in Ptolemaida – Application of Life Cycle Analysis and Exergy Analysis (July 2000), Pantelodimos N.
7. A Study of the Electricity and Hot Water Co-production Plant from the Geothermal Field at Eratino, Kavala, (July 2000), Bobolias Ch.
8. Exergy Analysis of Renewable Energy Sources, (July 2000), Spachos Th.

##### In progress:

1. Life Cycle Assessment of Cement Production, Vassilakis N.
2. Life Cycle Assessment of a Solar Heater, Zarzavas N.
3. Life Cycle Assessment and Exergy Analysis of a Petroleum Refinery, Bisda A.
4. Life Cycle Assessment of Beer, Garbari Z. and Papayiannidou E.
5. LCA and Exergy Analysis of Ethylene Production, Zisis P., Kotrotsios Z. and Limniotis K.
6. Life Cycle Assessment of Bauxite Mining, Yiama E.

#### Publications – Conferences

1. Moussiopoulos N. and Boura A. (1998), Life Cycle Analysis, *Proceedings of the HELCANET (Hellenic Life Cycle Analysis Network) Workshop*, 131 pp.
2. Boura A. and Moussiopoulos N. (1998), Life Cycle Analysis (LCA) as a tool of environmental management, *Proceedings from the workshop on Environmental Management and Eco Audit*, Technical Chamber of Greece, Athens, Greece, March 1998.
3. Papadopoulos A., Boura A. and Moussiopoulos N. (1998), Environmental Management Systems – Life Cycle Analysis of energy conservation systems, 12th National Congress of the Hellenic Operational Research Society, Samos, September 1998, Proceedings of the congress in press.
4. Koroneos Ch., Boura A., Moussiopoulos N. and Seitaridis Th. (1999), Environmental Impact Analysis of the Production of Packaging Paper: Application of Life Cycle Analysis, *Proceedings of 3rd International Exhibition and Conference on Environmental Technology (HELECO '99)*, Thessaloniki, June 1999; Vol. 2, 310-318.
5. Koroneos Ch., Boura A., Moussiopoulos N. and Balla Ch., (1999), Life Cycle Analysis: A Complete Approach, *Proceedings of 3rd International Exhibition and Conference on Environmental Technology (HELECO '99)*, Thessaloniki, June 1999 Vol. 2, 378-387.
6. Boura A., Koroneos Ch. and Moussiopoulos N. (1999), Life Cycle Analysis, Conventional and Inverse Approach – The Application on Washing Machines, *Proceedings of 6th International Conference of Environmental Science and Technology*, Samos, Greece, Vol. C, 328-336.
7. Boura A., Koroneos Ch., Ikonomou N. and Moussiopoulos N. (1999), Life Cycle Analysis as a Tool for Environmental

Management: An Application on Concrete, *Proceedings of the 13th Symposium on Concrete*, Réthimnon, Greece, October 25-27, 1999, 371-382.

8. Koroneos Ch., Fytikas M. and Moussiopoulos N. (2000), Exergy and LCA of Geothermal Energy production in small scale - A case in Greece, *World Geothermal Congress 2000*, Kyushu-Tohoku, Japan, 28 May-10 June, 2000.

### III Participation in LCA Networks

1. National Representatives (Moussiopoulos N, Boura A.) on LCANET (European Network for Strategic Life Cycle Assessment Research & Development). LCANET is a concerted action in the EU Environment and Climate programme, ENV4-CT95-0153, March '96 - May '97.
2. Representatives (Boura A.) on LCA net Food (An environmental study - LCA network on foods). LCA net Food is a con-

certed action in the Food and Agricultural Programme (FAIR), EU-97-3079, November '97-October '99.

3. National Representatives (Boura A, Koroneos Ch.) on CHAINET (European network on chain analysis for environmental decision support). CHAINET is a concerted action in the EU Environment and Climate programme, ENV4-CT97-0477, December '97-November '99.
4. National Representatives (Koroneos Ch.) on the European Program for the Electronic product Industry "SCARE" (Strategic Comprehensive Approach for Electronic Recycling and Reuse). SCARE is under the umbrella of EUREKA, July '98-July '04.

### References

- [1] Int. J. LCA (5) 1998, Conference Reports, "First LCA Workshop in Greece", p. 288
- [2] Int. J. LCA (5) 1998, LCA Strategies, "Hellenic Life Cycle Assessment Network (HELCANET)", p. 272

## JLCA Corner

### Applications of LCA in 'Eco-Products 1999'

Norihiro Itsubo

JEMAI (Japan Environmental Management Association for Industry), Ueno 1-17-6, Taito-Ku, Tokyo 110-8535, Japan; phone: +81-3-3832-0515, (fax: -2774); e-mail: [itsubo@jema.or.jp](mailto:itsubo@jema.or.jp); website: <http://www.jema.or.jp>

The exhibition 'Eco-Products 1999' was opened from December 10th to 12th, 1999 at Tokyo International Exhibition Center by JEMAI and Nihon Keizai Shimbun, Inc. This is the first exhibition in Japan concerning environmentally-conscious products on a large scale, 274 companies and 14 NGO contributed here. The total number of attendance was 47449 from consumer, enterprise, self-governing body, NGO, etc.

Eco-Products 1999 was held to realize the following objectives, (1) Educating product designers to apply LCA into the design for environment and ecolabeling Type III (2) Promote the recognition of the importance of life-cycle thinking in the management of enterprise (3) Understanding the necessity considering the concepts of life cycle in the selection of products to consumer

Realizations of these objectives promote the recognition of LCA to the executives and product designers of companies and the consumer. As a result of this knowledge, the interests for the LCA National Project of Japan would be increased, and the importance for the applications of the results in this project would become well known to the public.

There are no restrictions on exhibitions, but exhibits should be eco-products, or the processes and technologies for manufacturing eco-products. In this exhibition, 'Eco-Products' is defined as "Product or service that is environmentally efficient throughout its life cycle." Ideally, the criteria for the judgment as to whether the exhibits are Eco-products or not are to have the possibilities of indicating the labeling based on LCA. However, it is difficult for some of contributors to complete LCA, because of the difficulties of applying LCA. So the products that satisfy the requirements prepared by executive committees in advance have been accepted as eco-products.

The companies that exhibit products with the results of LCA are CANON, RICOH, INAX. They applied the results of LCA for their products (copy machine, printer, bath unit, etc.) into the pro-

gram of type III labeling proposed by JEMAI. This type III ecolabeling specifies the inventory table and some of the results of impact assessment classified into the main life cycle stages like preparation, manufacturing, transportation, usage and maintenance, recycle and disposal. Inventory table specifies the consumption of electricity and resources (fossil fuels, water, metal ores, etc.), emission of environmental loading substances (airborne, waterborne) and wastes (incinerated ashes, landfilled, etc). Currently, JEMAI revised the program of type III to promote the application of LCA widely. So far the number of enterprises that approved of this program is 14 and would be increased in the future.

Toshiba, NEC, Hitachi, Fujitsu, Central Research Institute of Electric Power Industry, NIRE and JEMAI demonstrated their own LCA software in this exhibition.

The attended companies that indicate performing LCA in environmental reporting and leaflets are Toshiba, NEC, Toyota Motor, Toyo-Seimai Machine, Honda Motor, Konica, Fujitsu, SONY, Matsushita Electric Industrial, Mitsubishi Electric, Kubota, Shimadzu, Ebara, TOTO, Dai Nippon Printing, TOYOB.

According to the questionnaire, about 54 percentages of attended consumers replied to purchase eco-products in positive as far as possible after going around the exhibition. Furthermore, the industries of electric appliances, automobile, and business machines that are positive to perform LCA attracted the public. From these results, it can be concluded that Eco-Products 1999 has finished successfully.

The detailed information for 'Eco-Products 1999' like its visitors and a list of exhibitors is shown in the website: [http://www.nikkei.co.jp/events/eco/eng/index\\_e.html](http://www.nikkei.co.jp/events/eco/eng/index_e.html)

This year also, 'Eco-Products 2000' will be opened at Tokyo International Exhibition Center on December 14-16. The information related with this exhibition can be obtained from the website: [http://www.nikkei.co.jp/events/eco/eng/index\\_e.html](http://www.nikkei.co.jp/events/eco/eng/index_e.html)